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United States Patent [19]**Pierse**[11] **Patent Number:** **5,996,431**[45] **Date of Patent:** **Dec. 7, 1999**[54] **TWIST ACTION FRICTION DRIVE**

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United Kingdom[21] **Appl. No.:** **09/051,248**[22] **PCT Filed:** **Apr. 30, 1997**[86] **PCT No.:** **PCT/GB97/01174**§ 371 Date: **Apr. 2, 1998**§ 102(e) Date: **Apr. 2, 1998**[87] **PCT Pub. No.:** **WO98/10206****PCT Pub. Date:** **May 12, 1998**[30] **Foreign Application Priority Data**

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[51] **Int. Cl.⁶** **F16H 21/16**[52] **U.S. Cl.** **74/25; 74/89**[58] **Field of Search** **74/25, 89, 60;**
384/100[56] **References Cited****U.S. PATENT DOCUMENTS**

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Ed, pp. 8-130 to 8-131.*Primary Examiner*—Tamara L. Graysay*Assistant Examiner*—David Fenstermacher*Attorney, Agent, or Firm*—Lee, Mann, Smith, McWilliams,
Sweeney & Ohlson[57] **ABSTRACT**

A twist action roller friction drive comprises a rotating drive bar which drives in rotation a roller the axis of rotation of which is inclined relative to the axis of a rotationally fixed driven member with which the roller engages. The inclined roller comprises a single annular roller urged from the inside into driving contact with the driven member by one or more hydrostatic pads. The driven member is a tube and the skewed annular roller is in frictional engagement with the bore of the tube. In a typical use, the tube is fixed to the carriage of a machine tool and is aligned with the machine axis. Oil for the hydrostatic pad(s) acting on the roller is supplied through the drive bar along the axis thereof. At its trailing end, the drive bar rotationally drives a skewed roller assembly in which the annular roller is incorporated, the remote forward end of the drive bar being driven in rotation, as by an electric motor. Axial movement of the driven member is principally determined by the angle of skew of the roller so that if this angle is made very small, similarly small precise axial movements of the driven member of as little as 1 nm (nanometre) or less can be readily achieved, per revolution of the drive bar. This permits a high speed drive motor and in turn velocity feed back control.

17 Claims, 4 Drawing Sheets